IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of
Dirk ANDRITTER
Corres. to PCT/EP2004/007726
For: FIXING MEANS FOR AN OIL COOLER

VERIFICATION OF TRANSLATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Charles Edward SITCH BA,

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That the translator responsible for the attached translation is familiar with both the German and the English language, and that, to the best of RWS Group Ltd knowledge and belief, the English translation of the International Application No. PCT/EP2004/007726 is a true, faithful and exact translation of the corresponding German language paper.

I further declare that all the statements made in this declaration of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful, false statements may jeopardize the validity of legal decisions of any nature based on them.

January 3, 2006
Date

Name: C. E. SITCH
For and on behalf of RWS Group Ltd

BEHR GmbH & Co. KG
Mauserstraße 3, 70469 Stuttgart

Fixing means for an oil cooler

Oil coolers are fixed at least indirectly to the vehicle frame by means of a fixing means. In most cases, this takes place by the oil cooler being arranged below, in front of or behind another cooler and moreover being supported thereon via fixing means.

Particularly in their main direction of extent, oil coolers have linear expansion which, due to the not inconsiderable differences in temperature between operating temperature and ambient temperature in the case of the fixing, cannot be ignored. In addition, the oil cooler, due to its mass and the gear oil flowing to it under pressure, is also subjected to considerable acceleration forces and moments which have to be absorbed by appropriate fixing means.

It has therefore previously been customary to provide, in the region of the oil cooler, a screw hole which passes through the oil cooler and through which a screw bolt can be guided. The screw connection constitutes a secure mounting of the oil cooler on a fixing means, but has the disadvantage of being awkward to fit. However, complicated fixings of this type are considered necessary for securely holding the oil cooler in the driving mode. Fixing elements and receiving elements are produced from metallic materials in order to make a suitable stability unload possible, these materials having the disadvantage of being heavy.

It is therefore the object of the invention to provide

a fixing means for an oil cooler that can be produced and fitted in a simple and cost-effective manner.

This object is achieved by a fixing means according to the invention.

According to the invention, a fixing means for an oil cooler which is fixed in an oil cooler receiving element has a latching connection between oil cooler receiving element and oil cooler. The use of a latching connection is advantageous because it can be produced in a particularly simple manner during the installation of the oil cooler. A particularly favorable form of latching connection are clip connections, with use preferably being made of a clip connection which is releasable in a non-destructive manner. In this case, a clip connection is in particular a connection, in which a retaining element is secured, on the one hand, on a component in order to fix a functional element and, on the other hand, engages behind the functional element, in particular in an interlocking or interlocking and frictional manner. In the context of the application, this involves fixing an oil cooler because this is the preferred use. In principle, another additional cooler which is to be arranged in the vehicle may be involved in place of the oil cooler.

According to a preferred refinement of the invention, an energy store is provided which is part of the latching connection and keeps the oil cooler pretensioned in a defined desired position. The energy store is in particular a spring store which is formed from a material tongue which is formed on the latching receiving element and, when the oil cooler in introduced into the latching receiving element, is correspondingly pretensioned. The use of the spring store keeps the oil cooler in a defined position in particular in the introductory direction of the oil

cooler into the oil cooler receiving element. The play which is required in order to produce the latching connection or clip connection is eliminated by the pretensioning of the spring store. The spring store opposes in particular the acceleration forces and approach flow forces acting on the oil cooler. In addition, it is advantageous if the spring store is additionally divided in a dovetailed manner in the direction of action of the spring store and an alignment of the oil cooler in a further direction in the oil cooler receiving element is thereby made possible. This preferably takes place by a corresponding shaped section, such as a functional element of the oil cooler, for example a housing section of the oil cooler, penetrating the opening of the dovetail and being centered by the two flanks. The bearing of the dovetail against the corresponding element of the oil cooler is likewise achieved by the spring action. The two bearing points on the flanks and the support on the latch then ideally form a three-point support which makes a particularly well defined retention of the oil cooler possible.

According to a preferred refinement of the fastening means, the oil cooler receiving element is of U-shaped design. In this case, a respective latching connection is preferably provided on both limbs of the U-shape and is used to produce an engagement between oil cooler receiving element and oil cooler. In this case, provision can be made for the oil cooler receiving element to be of such elastic design that, when the oil cooler is introduced into the oil cooler receiving element, the limbs of the U-shape spread out, with this elastic spreading-out being at least partially reversed during the latching of the latching connection.

The limbs of an oil cooler receiving element of U-shaped design are preferably spaced apart vertically

from each other in the installation position of the oil cooler receiving element and aligned in the transverse direction of the vehicle. This corresponds to a design in which the limbs of the U-shaped receiving element engage over or under the oil cooler and the oil cooler is arranged in a horizontal alignment in the vehicle transversely with respect to the direction of travel. In this case, the arrangement of the oil cooler can be provided below and in front of or behind another cooler.

According to a further refinement of the invention, the oil cooler receiving element is fixed at least indirectly on the vehicle, with the fixings of the oil cooler receiving element preferably being adjustable in position, for which purpose, in particular, elongated holes are provided.

Otherwise, the invention is explained in more detail with reference to the exemplary embodiment illustrated in the drawing, in which:

Fig. 1 shows the perspective view of an oil cooler receiving element;

Fig. 2 shows an oil cooler held on a further cooler by means of an oil cooler receiving element;

Figs. 3a, 3b show, in different sectional illustrations, the mounting of the oil cooler in the oil cooler receiving element; and

Fig. 4 shows, in a three-dimensional illustration, the introduction of an oil cooler into the oil cooler receiving element.

Fig. 1 shows an oil cooler receiving element 10 in a perspective illustration. The oil cooler receiving

element comprises a U-shaped receiving region 11 and a basic body 12. The basic body 12 has fixings 13 which are in each case designed as an elongated hole and are used for the at least indirect fixing of the oil cooler on the vehicle side.

The receiving element 11 is of U-shaped design and comprises two limbs 14, which are aligned parallel to each other and are spaced apart vertically from each other, and a back web 15 which connects the two limbs 14 to each other. Each of the two limbs 14 has a latching lug 16 which is used for latching into a latching depression 17 of the oil cooler. An interlocking bearing at least in some sections is produced in this case. It is also possible for the latching lug 16 to engage behind a shaped section of the latching depression 17, with the result that in addition to the interlocking connection there can also be a frictional connection. The latching of the latching lug 16 in the latching depression 17 of the two limbs 14 enables an oil cooler 18 to be securely fixed in the oil cooler receiving element 10.

The back web 15 has integrally formed material tongues 19 which are bent away in such a manner that they project into the introductory space of the oil cooler 18 between the two limbs 14 of the oil cooler receiving element 10. Owing to the inherent elasticity of the material used, the material tongues 19 are used as spring leaves of a spring store. The material tongues 19 are divided here at their free ends in a dovetailed manner, with the V-shaped inner sides forming flanks 25 which serve for the centering reception of the oil cooler.

Fig. 2 shows, in a three-dimensional, perspective illustration, the arrangement of an oil cooler 18 in a region behind an additional cooler 20 which is arranged

below the main cooler 21. For this purpose, a respective receiving element 11 is fixed to the additional cooler 20 or to the mount thereof on both sides of the extent of the oil cooler in the transverse direction of the vehicle. The oil cooler 18 is held between the limbs 14 of the oil cooler receiving element 10. In this case, the oil cooler extends parallel to the further coolers in the transverse direction of the vehicle, with the figure illustrating a view which shows the direction of observation in the direction of travel from a point behind the arrangement of the coolers in the vehicle. In the approach-flow direction of the air flow flowing through the cooler, the oil cooler 18 is therefore situated behind the additional cooler 20, which may be, for example, the cooler of an air conditioning system.

Figs. 3a and 3b show sectional illustrations in different sectional directions through an oil cooler and an oil cooler receiving element. The section of Fig. 3a makes it possible to see, in a particularly favorable manner, how the of the two limbs 14 of the receiving element 11 of the oil cooler receiving element 10 the latching lugs 16 engage in the latching depressions 17 of the oil cooler. In this case, the latching depressions are formed in a with respect to the extent of the cooling lines 22, through which the gear oil flows, of the vertically aligned distributor channel 23. The distributor channel 23 essentially has a cylindrical basic shape and the latching depression 17 is formed by the cover 24 closing the distributor channel 23 being set back axially in the direction of extent in relation to the terminating edge. In addition, corresponding latching of the diameter and of the shape of the latching lug 16 of the limbs 14 makes it possible for a corresponding centering effect for the oil cooler in the fixing to be achieved. By simultaneous engagement at the two mutually opposite

ends of the distributor channel, a centering and fixing of the position of the oil cooler 18 in the receiving element 11 and therefore in the oil cooler receiving element 10 is achieved.

As can be seen in particular from Fig. 3b, the centering effect in the introductory direction can be further increased by the material tongues 19 acting as spring elements. The back web 15, which connects the two limbs 14 to each other, has material tongues 19 which project into the introductory space of the oil cooler 18, are divided in a dovetailed manner, act as a spring store and, owing to the bearing of the flanks 25, bear against the vertical channel 23 of the oil cooler and act upon the latter in the removal direction from the receiving element 11. On the one hand, this serves to secure the latching connection because an interlocking connection can then be produced between latching lug 16 and latching depression 17 in a particularly favorable manner, and, secondly, the oil cooler receiving element supports the oil cooler even in relation to forces running in the direction of travel, such as acceleration and deceleration forces.

Fig. 4 shows the introductory operation of an oil cooler 18 with a distributor channel 23 and cooling lines 22 into an oil cooler receiving element 10. The oil cooler receiving element has a basic body 12 which has fixing means 13, such as elongated holes, so that the oil cooler receiving element can be secured at least indirectly on the vehicle frame. In order to hold the oil cooler, the oil cooler receiving element 10 has a receiving element 11 which is of U-shaped design. The two limbs 14 protrude horizontally, parallel to each other and aligned in the direction of travel from a back web 15. The back web 15 has the material tongues, which are divided in a dovetailed manner, as spring store. When the oil cooler is introduced, in particular

the distributor channel 23 projecting into the region of the receiving element 11, the limbs 14 are first of all spread out elastically. The edge 26 of the distributor channel 23 comes into contact with the introductory slope 27 of the latching lug 16. The limbs 14 are spread out to such an extent that the latching lugs 16 can slide over the edge 26 and then the latching lugs 16 can drop into the latching depression 17 on the distributor channel 23. At the same time, the wall 28 of the distributor channel 23 comes into contact with the edges 26 of the dovetailed division of the material tongues 19 and presses the material tongues 19 out of their rest position into a pretensioned end position, from which they produce an interlocking bearing of the latching lug 16 in the latching depression 17 and cushion the oil cooler against being deflected out of this position in the introductory direction, i.e. direction of travel of the vehicle or in the opposite direction. These are in particular effective acceleration and deceleration forces from the driving mode. The oil cooler receiving element here is preferably produced from plastic, which firstly permits a low weight and secondly an adjusted plastic deformability with sufficient material stiffness.